Characterization of volatile production during seed storage

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This paper contributes to the understanding of factors that regulate seed longevity and mechanisms that cause seed deterioration during storage. The over-all goal is to characterize the types of chemical reactions that occur in dry seeds and to relate these to the properties of the seed glassy matrix and the inevitable decline in seed quality and viability. Oxidation and peroxidation reactions occur in stored seeds and are implicated in chemical degradation. Oxidation of macromolecules gives rise to low molecular weight carbonyl compounds, many of which are volatile and so escape into the airspace of the storage container. The identity of volatile compounds indicates the nature of chemical reactions. Production of volatile compounds from seeds of different species was investigated. Volatile composition produced by seeds differs with the species: species such as *Carum carvi* were detected to produce large amounts of volatile compounds, while others, such as *Eruca sativa,* produced low quantities of only a few compounds. Qualitative and quantitative differences in volatile composition were noted as a function of storage RH: above about 30% RH glycolysis-like reactions increase with increasing RH, and below about 30% RH peroxidation-like reactions increase with decreasing RH. Assessment of volatile production from seeds during storage provides a probe to address questions about the nature and kinetics of chemical reactions that occur in the glassy matrix of stored seeds. This information reveals important information about the glass such as the proximity of reacting ligands and inter- or intra-molecular motions required to effect chemical reactions. Moreover, it could be developed as a non-invasive and early detection method of seed ageing rates.

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